

IN THE ABSTRACT

A heat pump system includes a liquid pump used to circulate liquid through the system to prevent freezing when the heat pump is off. In the system, the liquid is circulated in the reverse direction during a freeze protection mode. The liquid used to prevent freezing comes from the hot section of the storage reservoir, such that the flow rate can be reduced while achieving the same amount of freeze protection. Also, as the hot liquid is circulated through the system at the low flow rate, it will become cold through heat transfer with the system as it prevents freezing and will be delivered to the cold section of the storage reservoir at a low temperature. As indicated above, the colder the temperature of the liquid supplied to the heat pump during operation, the more efficient the heat pump system will be. The present invention also prevents the cold liquid from lowering the temperature of the hot section of the storage reservoir during the freeze protection mode.